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How Is Radioactive Waste Transported?

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Audeen W. Fentiman
Jeffery A. Henkel
Ronald J. Veley

Low-level radioactive waste is generated by public utilities, industries, universities, and hospitals throughout the United States. The waste is shipped to available low-level waste disposal sites, primarily by truck in containers designed for transportation of low-level waste.

Transportation of low-level radioactive waste is regulated primarily by two government agencies. They are the U.S. Department of Transportation-Office of Motor Carriers (under authority of the Motor Carrier Act) and the Nuclear Regulatory Commission (under authority of the Atomic Energy Act and the Energy Recovery Act of 1974). The **Code of Federal Regulations** contains the regulations written by both agencies.

This fact sheet outlines the principal regulations governing the transportation of low-level radioactive waste.

U.S. Department of Transportation

The U.S. Department of Transportation specifies regulations for container safety, labeling, routing, and emergency response for the transportation of low-level radioactive waste. The regulations can be found in the "Hazardous Materials" section of Title 49 of the Code of Federal Regulations. This section contains summaries of those regulations.

Container Safety

Low-level radioactive waste may be packaged for transportation in three types of containers. Materials with very low radiation levels may be transported in what the regulations refer to as a **"strong, tight container"**. An example of a strong, tight container is a plywood box secured with steel bands. Materials with higher radiation levels must be shipped in Type A or Type B containers. **Type A containers**, used to transport most low-level waste, are typically steel drums or steel boxes. **Type B containers**, used in transporting waste with high radiation levels, are heavy engineered metal casks.

Container testing is required to ensure the safe transportation of the low-level radioactive waste. Tests for Type A containers simulate normal transportation conditions while those for Type B containers simulate both normal and accident conditions. The reason for the difference in testing is that the amount of radioactive material allowed in a Type A container is so low that a radiation hazard is unlikely, even if a Type A container did break open in an accident. Tests of Types A and B containers include a water

spray to simulate a severe rainstorm and dropping the container from prescribed heights (free drop). Tests for Type A and Type B containers are listed and explained in Table 1.

Labeling

The U.S. Department of Transportation provides a clear and simple system for labeling low-level radioactive waste for transportation. The containers are labeled I (white), II (yellow), and III (yellow) (see Figure 1). The higher the number, the greater the precautions required for safety during transportation. Labels are also placed on the exterior of the truck in a prominent position.

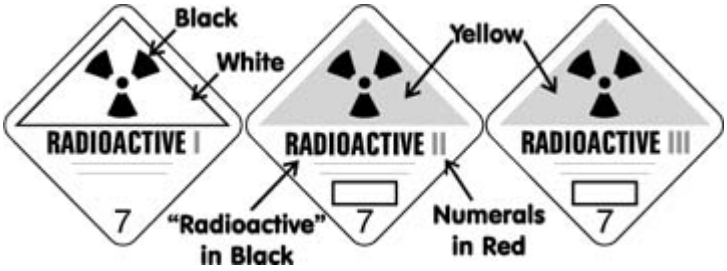

Figure 1. Labels for Shipments of Low-Level Radioactive Waste

Routing

Routing of shipments of low-level radioactive waste is regulated. Shipments must meet the following requirements:

- motor vehicles operate on routes that minimize radiological risk,
- available information on accident rates, transit time, population density and activities, and the time of day and day of week are used to determine the level of radiological risk,
- route is specified and the vehicle operator is informed that the transported material is radioactive, and
- an Interstate System bypass or beltway around a city is used when available.

Emergency Response Information

All parties involved in the transportation of radioactive material must maintain information that is pertinent in the event of an emergency. The information includes descriptions of the radioactive material, health concerns, and procedures for handling an emergency. The company that generated the waste must maintain a 24-hour telephone number monitored by qualified emergency response personnel.

Regulation Enforcement

The U.S. Department of Transportation uses an "audit program" to enforce regulations specified for the transportation of low-level radioactive waste. Companies transporting low-level waste are assigned a safety rating based on inspection results, accident record, and the size and number of vehicles. On the basis of the safety rating, the U.S. Department of Transportation prioritizes its audits of transportation companies to enforce the regulations specified in the Code of Federal Regulations.

Nuclear Regulatory Commission

Type B containers for transportation of low-level radioactive waste must meet not only the U.S.

Department of Transportation's requirements, but also those of the Nuclear Regulatory Commission. The Nuclear Regulatory Commission regulations specify tests for Type B containers. The regulations can be found in the "Packaging and Transportation of Radioactive Material" section of the Code of Federal Regulations. Tests required by the Nuclear Regulatory Commission simulate both normal conditions of transport and hypothetical accident conditions (see Table 1). Type B containers must pass these tests to be approved by the Nuclear Regulatory Commission for transporting low-level waste.

Table 1. Tests of Containers Used to Ship Low-Level Radioactive Waste

Test	Explanation	Container Type
Water Spray	Simulates rainfall	A
Temperature	Between -40 and 100 degrees Fahrenheit	A
Compression	A weight 5 times as heavy as the package sits on top of the package for 24 hours	A
Free Drop	Package is dropped 1 to 4 feet, depending on weight of package	A
Penetration	A 13 pound 1.25-inch diameter steel cylinder is dropped on the package from a height of 40 inches	A
Vibration	Simulates normal transportation vibration	A
Pressure	Tested in both increased and decreased external pressures	A
Free Drop	Package is dropped 30 feet onto an unyielding surface	B
Puncture	Package is dropped 40 inches onto a steel bar in a vertical position	B
Heat	30 minutes at a temperature of 1475 degrees Fahrenheit	B
Immersion	Under 50 feet of water for 8 hours	B

Safety Record

During the 20-year period from 1971 to 1991 there were 53 reported accidents involving transportation of commercial low-level radioactive waste in the United States. Four of those accidents resulted in a release of low-level waste. To date no radiological related injuries or deaths have been reported as a result of commercial low-level waste transportation accidents.

For More Information

If you would like to read more about the transportation of low-level radioactive waste, some of the references listed below might be helpful.

Code of Federal Regulations, Title 10, Part 71, "Packaging and Transportation of Radioactive Material", 1992. (Nuclear Regulatory Commission regulations)

Code of Federal Regulations, Title 49, Part 173, Subpart I, "Radioactive Materials", 1992. (Department of Transportation regulations)

Author Notes:

Dr. Audeen W. Fentiman is an Assistant Professor in Nuclear Engineering at The Ohio State University.

Jeffery A. Henkel is a Graduate Research Associate in Nuclear Engineering. Ronald J. Veley is a Graduate Research Associate, Ohio State University Extension.

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